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Research Article

Social Network Types and Mental Health Among LGBT Older Adults

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Abstract

Purpose of the Study: This study was designed to identify social network types among lesbian, gay, bisexual, and transgender (LGBT) older adults and examine the relationship between social network type and mental health.
Design and Methods: We analyzed the 2014 survey data of LGBT adults aged 50 and older (N = 2,450) from Aging with Pride: National Health, Aging, and Sexuality/Gender Study. Latent profile analyses were conducted to identify clusters of social network ties based on 11 indicators. Multiple regression analysis was performed to examine the association between social network types and mental health.
Results: We found five social network types. Ordered from greatest to least access to family, friend, and other non-family network ties, they were diverse, diverse/no children, immediate family-focused, friend-centered/restricted, and fully restricted. The friend-centered/restricted (33%) and diverse/no children network types (31%) were the most prevalent. Among individuals with the friend-centered/restricted type, access to social networks was limited to friends, and across both types children were not present. The least prevalent type was the fully restricted network type (6%). Social network type was significantly associated with mental health, after controlling for background characteristics and total social network size; those with the fully restricted type showed the poorest mental health.
Implications: Unique social network types (diverse/no children and friend-centered/restricted) emerge among LGBT older adults. Moreover, individuals with fully restricted social networks are at particular risk due to heightened health needs and limited social resources. This study highlights the importance of understanding heterogeneous social relations and developing tailored interventions to promote social connectedness and mental health in LGBT older adults.

Keywords: Social network typology, Sexual orientation, Gender identity, Social relations, Latent profile analysis

Social networks can provide older adults with dynamic contexts that promote optimal aging through the exchange of emotional, instrumental, and/or informational support and interpersonal engagement (Antonucci, Ajrouch, & Birditt, 2014; Berkman & Glass, 2000; Krause, 2006). Social network size in later life often decreases, but many older adults maintain their emotionally close ties (English & Carstensen, 2014), which appear to positively influence health and well-being (Huxhold, Fiori, & Windsor, 2013). Prior research documents that lesbian, gay, bisexual, and transgender (LGBT) adults experience health disparities in older age (Fredriksen-Goldsen, Kim, Barkan, Muraco, & Hoy-Ellis, 2013); limitations in social networks may be an important explanatory factor accounting for mental health disadvantages in this historically marginalized community (Hatzenbuehler, Phelan, & Link, 2013).

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Social networks among LGBT older adults have typically been studied by examining either overall social network size or proportions of individuals who have particular social ties. Higher levels of social network size and social support among LGBT older adults have been associated with lower likelihoods of poor general health, disability, and depression (Fredriksen-Goldsen et al., 2013) as well as loneliness (Kim & Fredriksen-Goldsen, 2014) and higher levels of physical and mental health-related quality of life (Fredriksen-Goldsen, Kim, Shiu, Goldsen, & Emlet, 2015). In addition, among lesbian, gay, and bisexual older adults, living with a partner was associated with better mental health (Grossman, D'Augelli, & O'Connell, 2002; Williams & Fredriksen-Goldsen, 2014). This variable-centered approach, however, does not comprehensively capture the structure of LGBT people's social networks. For example, social networks that are similar in size may comprise different types of social ties, which would provide differential social environments. To date, no studies have been conducted to identify social network types among LGBT older adults. This article applies a person-centered approach to examine differing social network types (social network composition patterns) among LGBT older adults and investigates their relationship with mental health.

Conceptual Framework

This study utilizes the Health Equity Promotion Model (HEPM; Fredriksen-Goldsen, Simoni et al., 2014) and the Convoy Model of Social Relations (Antonucci et al., 2014) as guiding frameworks to identify LGBT older adults' social network types, including family and non-family ties, and to examine the associations between social network types and mental health. According to the HEPM, one of the key factors accounting for health outcomes among LGBT older adults is social relations. Adverse experiences of discrimination and social exclusion may prevent some LGBT individuals from building supportive social ties, and the resulting risk of social isolation could lead to poorer mental health (Hatzenbuehler et al., 2013). Despite adversity, however, many LGBT adults have developed and maintained supportive social networks in later life (Fredriksen-Goldsen et al., 2011), which positively influences their health and well-being (Fredriksen-Goldsen, Emlet et al., 2013). As the Convoy Model suggests, like older adults generally, LGBT older adults may have established "social convoys," that is, networks of supportive social ties that move with them through the life course, with network patterns potentially differing by context and circumstances (Antonucci et al., 2014).

Social Network Types

Various social network types are observed among older adults. The social relation indicators typically utilized to determine social network types include marital status, numbers of ties and frequency of contacts with children, close relatives, friends, and neighbors, and participation in social activities. Although most studies have found five or six social network types among older adults, four common network types have emerged across studies: diverse, family-centered, friend-centered, and restricted networks (Antonucci et al., 2014). Older adults with diverse social networks have extensive ties to family members, friends, neighbors, and other social connections. Family-centered social networks, by comparison, consist of relatively higher proportions of immediate family members including spouse/partner, children, siblings, and parents, whereas friend-centered social networks are characterized by relatively closer and more frequent contact with friends than with other social ties. Limited numbers of social ties and low frequency of contact across all social dimensions are common characteristics of the restricted social network type. Unique network type patterns also emerge within specific cultural contexts as the Convoy Model suggests (Antonucci et al., 2014). For example, among American older adults in general, family-centered network types were least prevalent and diverse network types were most prevalent (Fiori, Antonucci, & Cortina, 2006). On the other hand, in a sample of Korean immigrants aged 60 and older in the United States, family appeared to have a central role across more social network types; however, the friend-centered network type was not distinctively observed (Park et al., 2015).

No empirical studies to the best of our knowledge have been conducted to identify social network types among LGBT older adults, but there are reasons to posit that LGBT older adults' social network structure may differ from that of older adults in general. LGBT older adults came of age when severe stigmatization and marginalization of sexual minorities were pervasive (Kane, 2003) and those experiences and fear of discrimination may have led to fewer social ties (Grant, 2010). Ongoing structural exclusion, such as the lack of national same-sex marriage rights until the 2015 U.S. Supreme Court decision, may also lead to greater social isolation among LGBT individuals (Hatzenbuehler et al., 2013). In addition, current cohorts of LGBT older adults experienced the HIV/AIDS pandemic and many as a result of lost important social network ties. Furthermore, although identity disclosure is associated with larger, more supportive social networks among LGBT older adults (Erosheva, Kim, Emlet, & Fredriksen-Goldsen, 2015; Grossman, D'Augelli, & Hershberger, 2000) and creates opportunities to find partners and/or friends with similar interests (Mohr & Fassinger, 2006), it can also result in conflict with family members, friends, and significant others (Herek & Capitanio, 1996), which may affect social network composition. Thus, for many reasons, conceptualizations of kin networks that emphasize relationships defined through biology or marriage may not adequately reflect the complexity of social networks of LGBT older adults.

In fact, population-based studies document that sexual minority older adults have more limited family ties; lesbian,

gay, and bisexual older adults are less likely to be married than their heterosexual peers, less likely to have a child, and more likely to live alone (Fredriksen-Goldsen, Kim, et al., 2013; Wallace, Cochran, Durazo, & Ford, 2011). Transgender older adults, compared with non-transgender lesbian, gay, and bisexual older adults, are more likely to have been legally married and to have children and less likely to live alone, yet they are also more likely to have been divorced and to have less social support (Fredriksen-Goldsen, Cook-Daniels, et al., 2014). With more limited ties to biological family, "family of choice" ties, based on friendship and commitment, are prominent in LGBT communities (Weeks, Heaphy, & Donovan, 2001). In addition, prior research finds that gay men and lesbians are more likely than heterosexuals to desire continued friendship and ongoing contact with ex-partners (Peplau & Fingerhut, 2007).

The four common social network types (diverse, friend-centered, family-centered, and restricted types) observed in other older adult populations may also emerge among LGBT older adults. However, the distribution of the four social network types among LGBT older adults may not be the same as for older adults in general. For example, because of the lower prevalence of marriage and parenthood among LGBT older adults (Fredriksen-Goldsen, Kim, et al., 2013), the family-centered type may not be as common in this population. In addition, friend ties are strong and widespread in this population (MetLife, 2010; Weeks et al., 2001), so multiple types of friend-centered networks may be observed.

Social Network Types and Mental Health

Prior research finds that social network types are differentially associated with mental health outcomes. One common finding is that social network types characterized by access to various social resources, such as a diverse network type, are associated with better psychological well-being than more restricted network types. For example, the prevalence of depressive symptomatology (Fiori et al., 2006; Park et al., 2015) was lowest among older adults with diverse networks. Compared with a restricted network type, diverse, friend-centered, and religious activity-centered network types are associated with lower anxiety and greater happiness among older adults (Litwin & Shiovitz-Ezra, 2011). A friend-centered network seems to be as beneficial as a diverse network. Fiori and colleagues (2006) found that older adults who had friend ties but not family ties, compared with those who had family ties but not friend ties, reported lower depressive symptomatology. On the other hand, older adults with restricted social networks consistently report poorer mental health (Fiori et al., 2006; Park et al., 2015), a lower level of well-being (Litwin & Shiovitz-Ezra, 2011), and a higher likelihood of mortality (Litwin & Shiovitz-Ezra, 2006) than older adults whose social network types feature greater connectedness with close others. Although there is limited research examining social network types among LGBT older adults, other indicators of social disconnectedness, such as being single and low social network size, have found to be associated with loneliness (Kim & Fredriksen-Goldsen, 2014) and poorer mental health (Fredriksen-Goldsen et al, 2015) among LGBT older adults.

Research Questions

Drawing upon the HEPM, the Convoy Model, and previous literature, this study was designed to (i) identify social network types among LGBT older adults based on relationship status, numbers of close ties, and frequencies of contacts with ex-partner, children, other family members, friends, and neighbors and (ii) examine associations between social network type and mental health. We hypothesized that diverse, friend-centered, family-centered, and restricted network types would emerge among LGBT older adults and that LGBT older adults whose network types included more diverse social ties and friend ties would have better mental health.

Methods

Design and Study Sample

We used the first wave of data from Aging with Pride: National Health, Aging, and Sexuality/Gender Study (NHAS), a longitudinal study of those who were born during or after 1964 and who self-identified as lesbian, gay, bisexual, or transgender or were engaged in same-sex sexual behavior or a romantic relationship with someone of the same sex or gender. The data were collected in 2014 from 2,450 participants via aging agency contact lists and successive chain-referral sampling across all U.S. census divisions. The sample was stratified by age cohort, gender, race/ethnicity, and geographic region. The participants completed paper or online questionnaires according to their preference. In the unweighted sample, the average age was 66.2 years (SD = 8.8, range: 50–98 years), 56.7% of the participants were men, 86.0% were gay or lesbian, 8.9% were bisexual, and 8.4% were transgender.

In order to reduce sampling bias and increase the generalizability of the findings, we applied survey weights to statistical analyses. Survey weights were computed utilizing three external probability samples' data as benchmarks following two-step postsurvey adjustment, as has been applied to other types of nonprobability samples (Lee, 2006; Lee & Valliant, 2009). In the first step, the Aging with Pride: NHAS sample was combined with the National Health Interview Survey (NHIS) sample ascertaining sexual orientation by sexual identity, and we computed the probability of being selected from the NHIS versus the Aging with Pride: NHAS sample by using a logistic regression model with age, sex, sexual orientation, Hispanic ethnicity, race, education, region, and home ownership as covariates. In the second step, we further calibrated the weights for those

in same-sex partnerships, another indicator of sexual orientation. The population totals by age, race/ethnicity, gender, education, marital status, and region were estimated from the NHIS, the American Community Survey, and the Health and Retirement Study. See Fredriksen-Goldsen and Kim (2017) for a more detailed description of methods, including sampling strategies, response rates, and the post-survey adjustment procedures.

Measures

Social network type indicators

The measures used to identify network types were relationship status and the numbers of close ties and frequencies of contacts with children, other immediate family members (e.g., brothers or sisters, parents, cousins, or grandchildren), ex-partners, friends, and neighbors. Relationship status was assessed by asking "What is your current relationship status?" and the response options were "partnered or married" (= 1) and "single" (= 0). To measure number of close ties, we asked how many of their living children they have a close relationship with, and similar questions regarding other immediate family, ex-partners, friends, and neighbors. The number of close ties with each relational type was truncated to a maximum value of 10 to reduce the influence of outliers. We also measured frequency of contact with each relational type. For example, we asked "On average, how often do you talk or communicate with any of your children?" The range was never (= 0) to every day (= 5).

Health outcomes

To measure mental health, we utilized the psychological domain of WHOQOL-BREF, developed by the World Health Organization Quality of Life project (Bonomi, Patrick, Bushnell, & Martin, 2000). The psychological domain consists of six items assessing positive and negative affect, body image acceptance, self-esteem, concentration, and personal beliefs. A summary score was calculated following the formula recommended in the user manual (The WHOQOL Group, 1998). The range of the summary score is 0 to 100 with a higher score meaning better mental health.

Background characteristics

Demographic information included age (in years), gender (0 = male; 1 = female), sexual identity (1 = gay or lesbian; 0 = other), gender identity (0 = non-transgender; 1 = transgender), race/ethnicity (1 = non-Hispanic White; 0 = other), education (0 = >high school; 1= ≤high school), income (0 = >200% federal poverty level [FPL]; 1 = ≤ 200% FPL), any difficulties in activities of daily living (ADLs; 0 = no difficulty; 1 = any difficulty), and total social network size. Difficulties in ADLs were measured by asking how much difficulty participants had with six activities in the past month: dressing, walking across a room, using the toilet, eating meals, bathing or showering, and moving in and out of a bed or chair (Chan, Kasper, Brandt, & Pezzin, 2012). Total social network size was calculated by summing the numbers of people including partner/spouse, children, other immediate family members, ex-partners, friends, and neighbors the respondents reported as close ties.

Statistical Analysis

To identify social network types among LGBT older adults, we applied latent profile analysis (LPA; Bartholomew, 1987; Lanza, Flaherty, & Collins, 2003) utilizing Mplus version 7.4 (Muthén & Muthén, 1998–2015). LPA is a person-centered approach based on the assumption that an unobserved heterogeneity of social network types exists and can be manifested by identifying clusters of similar respondents across a set of indicators. LPA is particularly advantageous for the study of criterion indicators measured on different scales (in this case, one binary indicator and 10 continuous indicators). For this analysis, the indicators were relationship status, the numbers of close ties and frequencies of contacts with children, other immediate family members, ex-partners, friends, and neighbors. We compared solutions ranging from 2 to 7 clusters. To select the best solution, we evaluated several model-fit criteria including the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), entropy (an index of classification certainty with values closer to 1 indicating higher certainty), and the Lo-Mendell-Rubin likelihood ratio test which, if significant, indicates better fit compared with a solution with one fewer cluster (Collins & Lanza, 2010; Nylund, Asparouhov, & Muthen, 2007). We also considered the substantive interpretation of solutions (Lanza, Patrick, & Maggs, 2010). The profiles of the identified clusters were then examined, as were the distributions of each criterion indicator by the clusters using analysis of variance and χ^2 tests. Next, we examined the relationships between background characteristics and the identified social network types by applying linear or logistic regressions. Lastly, we applied multiple linear regressions to examine the relationship between social network types and mental health, after controlling for background characteristics as well as total network size. The regression analyses were performed using STATA/SE for Windows (Version 14.1).

Results

Social Network Types

According to fit statistics for LPA solutions (Table 1), entropy was highest for the 4- and 5-cluster solutions. The Lo-Mendell-Rubin likelihood ratio test favored the 4-cluster solution, showing that adding a 5th class did not significantly improve model fit, whereas AIC and BIC values favored the 5-cluster solution. Because the 5-cluster solution yielded clusters that were more substantively

interpretable than the 4-cluster solution, we retained the 5-cluster solution. Table 2 shows the profiles of the 5-cluster LPA solution. Numbers in brackets indicate the results of pairwise comparisons between clusters on each indicator. For example, in Cluster 1, 63.2% were partnered/married, and this proportion was significantly different than the proportions in Clusters 4 and 5 but not different than those in Clusters 2 and 3.

Cluster 1 (14.1%) was labeled "diverse network type." Most with the diverse network type were partnered/married, and they had the highest number of ties and frequency of contacts of all the clusters with children, and other immediate family members. Although a low level of ex-partner ties was present across the clusters, the diverse network type still showed the highest number and contact frequency of ex-partner ties. They also had a high number of and contact frequency of friend ties that did not differ significantly from the cluster with the highest friend ties (Cluster 2). The frequency of contact with neighbors was the highest for Cluster 1, too. Cluster 2 (31.3%), labeled "diverse/no children network type," was similar to the diverse network type across most indicators with the exception of children; individuals in the diverse network type tended to have ties to children whereas those in the diverse/no children network type did not. The diverse/no children network type had the highest number of neighbor ties. Cluster 3 (15.9%), labeled "immediate family-focused network type," had the highest probability of being partnered or married; this type appeared similar to the diverse network type in terms of ties to children and other immediate family, but had fewer ties and less contact with friends and neighbors. Cluster 4 (32.8%), labeled "friend-centered/restricted network type," had fewer friends compared with the diverse and diverse/no children network types, but more than the immediate family-focused network type. The frequency of contact with friends was similar with that for the diverse network type. The friend-centered/restricted type showed very few ties with children and neighbors and lower probability of being partnered or married. Finally, Cluster 5 (5.9%), labeled "fully restricted network type," showed a limited number and contact frequency of ties across all the criterion indicators; those with this type were unlikely to be

Table 1. Fit Statistics for Latent Profile Analysis Solutions with 2–7 Clusters

Model	AIC	BIC	Entropy	LMR LRT
2 Classes	84,127.039	84,289.546	.959	$p < .001$
3 Classes	81,150.535	81,382.689	.928	$p = .004$
4 Classes	78,627.923	78,929.723	.965	$p = .011$
5 Classes	77,066.396	77,437.842	.962	$p = .280$
6 Classes	76,297.706	76,738.798	.931	$p = .417$
7 Classes	75,601.979	76,112.717	.926	$p = .356$

Note: AIC = Akaike information criterion (lower values indicate better fit); BIC = Bayesian information criterion (lower values indicate better fit); LMR LRT = Lo-Mendell-Rubin likelihood ratio test (significance indicates better fit compared with a solution with one fewer cluster).

Table 2. Profiles of Social Network Types

		Social network type					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	
Indicator	Total	Diverse	Diverse/no children	Immediate family-focused	Friend-centered/ restricted	Fully restricted	Statistics
Partnered/married (%)	51.0	63.2 [4,5]	55.0 [3,4,5]	**66.2** [2,4,5]	41.1 [1,2,3,5]	14.4 [1,2,3,4]	$\chi^2 = 173.47$***
No. of close ties (*M*)							
Children	0.53	**1.74** [2,4,5]	0.00 [1,3]	1.72 [2,4,5]	0.00 [1,3]	0.05 [1,3]	$F = 105.26$***
Other immediate family	2.24	**2.82** [3,4,5]	2.44 [5]	2.11 [1,5]	2.18 [1,5]	0.38 [1,2,3,4]	$F = 61.16$***
Ex-partner	0.67	**0.97** [2,4]	0.65 [1]	0.77	0.58 [1]	0.37	$F = 2.89$*
Friends	3.84	4.55 [3,4,5]	**4.84** [3,4,5]	3.04 [1,2,4,5]	3.73 [1,2,3,5]	0.01 [1,2,3,4]	$F = 437.27$***
Neighbor	1.06	2.20 [2,3,4,5]	**2.66** [1,3,4,5]	0.00 [1,2]	0.01 [1,2]	0.02 [1,2]	$F = 139.55$***
Frequency of contact (*M*)							
Children	1.26	**3.98** [2,4,5]	0.06 [1,3]	3.81 [2,4,5]	0.07 [1,3]	0.37 [1,3]	$F = 989.41$***
Other immediate family	2.90	**3.07** [5]	2.98 [5]	2.79 [5]	3.00 [5]	1.83 [1,2,3,4]	$F = 4.86$***
Ex-partner	1.28	**1.63** [2,4,5]	1.27 [1]	1.45	1.13 [1]	0.90 [1]	$F = 3.24$*
Friends	3.85	4.14 [3,5]	**4.25** [3,4,5]	3.76 [1,2,4,5]	4.01 [2,3,5]	0.56 [1,2,3,4]	$F = 225.99$***
Neighbor	1.66	**3.62** [3,4,5]	3.48 [3,4,5]	0.09 [1,2]	0.13 [1,2]	0.33 [1,2]	$F = 1131.57$***
Unweighted *N*		315	900	313	807	115	
Weighted %		14.1	31.3	15.9	32.8	5.9	

Note: Frequency of contacts (0 = never; 1 = more than once a year; 2 = a few times a year; 3 = a few time a month; 4 = once a week; 5 = every day). Number of close network (range: 0–10). Weighted estimates are presented. The highest mean value is presented in bold and the lowest value is underlined for each cluster indicator. Superscript numbers in brackets indicate clusters with significantly different values.
*$p < .05$. ***$p < .001$.

partnered/married or have children and had low numbers of ties and contact frequencies with other immediate family, ex-partners, friends, and neighbors.

Comparison of Background Characteristics by Social Network Type

Linear regression (for continuous background characteristics) and logistic regression (for binary background characteristics) were applied to examine differences in background characteristics by social network type. Results of these comparisons are shown in Table 3. The friend-centered/restricted type was used as the reference category for each comparison because it was the most prevalent social network type and because it could be compared with network types with more social resources as well as those with the least social resources.

Compared with the friend-centered/restricted type, LGBT older adults with the diverse/no children type were significantly older. Those with the diverse, diverse/no children, and immediate family types were more likely to be women. Those with the immediate family-focused type were less likely to identify themselves as lesbian or gay. Those with the immediate family-focused and fully restricted types were more likely to identify their gender identity as transgender. No significant differences by race/ethnicity emerged. LGBT older adults with the diverse and immediate family-focused types showed higher educational levels, and those in the fully restricted type had lower educational levels. Those with the diverse, diverse/no children, and immediate family-focused types showed higher household income. Those with the fully restricted type were more likely to report difficulties with ADLs. Finally, LGBT older adults with the diverse, diverse/no children, and immediate family-focused types showed greater total network size; those with the fully restricted type showed the smallest total network size. Specifically, the average network size of individuals with the fully restricted network type was less than one.

Mental Health by Social Network Type

Finally, to test our hypothesis that having more diverse network ties would be associated with better mental health, we used linear regression to examine whether mental health differed between social network types, with the friend-centered/restricted type as the reference category. Because background characteristics were associated with network types, we controlled for background characteristics (Model 1). In Model 2, we also controlled for the overall network size to examine whether network type would predict mental health over and above the effect of network size.

Results are summarized in Table 4. Compared with LGBT older adults with the friend-centered/restricted type, LGBT older adults with the diverse and diverse/no children types showed better mental health after controlling for background characteristics, and those in the fully restricted type showed poorer mental health. These results did not change when network size was entered into the model (Model 2), even though network size did significantly predict mental health. These results indicate that, although larger social networks are associated with better mental health, social network type explains additional variance in mental health. The proportions of variance in mental health explained by Model 1 and Model 2 were 25.0% ($F = 57.37$; $p < .001$) and 28.4% ($F = 40.45$; $p < .001$), respectively. The change in R^2 from Model 1 to Model 2 ($\Delta R^2 = 0.03$; $p < .001$) was statistically significant.

Discussion

To the best of our knowledge, this is the first study to use a person-centered typology approach to identify social network types among LGBT older adults. Utilizing the HEPM

Table 3. Comparison of Background Characteristics by Social Network Type

		Social network type				
Characteristic	Total	Diverse	Diverse /no children	Immediate family-focused	Friend-centered/ restricted (ref)	Fully restricted
Age, *M*	61.41	61.44	62.61**	61.01	60.65	60.36
Gender, Women, %	46.13	58.51***	44.13*	66.34***	34.19	40.34
Sexual identity, Gay/lesbian, %	72.26	67.94	80.13	56.03***	76.08	62.89
Gender identity, Transgender, %	16.79	16.29	10.47	26.19***	15.16	35.41***
Race/ethnicity, POC, %	22.41	18.31	21.41	21.75	23.33	34.28
Education, ≤ High school, %	25.77	15.65*	26.38	17.25*	29.67	48.22*
Income, ≤ 200% FPL, %	28.67	17.93***	26.19*	23.14*	36.21	41.24
Any difficulties in ADL, %	33.59	28.12	30.80	37.35	33.20	54.67**
Network size, M	8.19	12.21***	9.87***	7.98**	6.25	0.94***

Note: ADL = activities of daily living; FPL = federal poverty level; POC = person of color; ref = reference group.
Weighted estimates are presented.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4. Summary of Multiple Regression Analyses for Social Network Type, With and Without Total Social Network Size, Predicting Mental Health

	WHOQOL-BREF psychological health			
	Model 1		Model 2	
Variable	*b*	95% CI	*b*	95% CI
Social network type				
Diverse	8.59***	5.19, 11.99	4.91**	1.26, 8.57
Diverse/no children	5.58***	2.96, 8.20	3.28*	0.65, 5.91
Immediate family-focused	0.57	−3.10, 4.24	−0.50	−4.09, 3.09
Friend-centered/restricted	(ref)	—	(ref)	—
Fully restricted	−14.57***	−20.05, −9.08	−11.49***	−17.09, −5.89
Total social network size	—	—	0.64***	0.44, 0.84

Note: CI = confidence interval; ref = reference group.
Weighted estimates are presented. Estimates are adjusted for age, gender, sexual identity, gender identity, education, income, race/ethnicity, and difficulties in activities of daily living.
*$p < .05$. **$p < .01$. ***$p < .001$.

(Fredriksen-Goldsen, Simoni, et al., 2014) and the Convoy Model of Social Relations (Antonucci et al., 2014) as guiding frameworks, we found five distinct social network types; ordered from greatest to least access to social resources, they were diverse, diverse/no children, immediate family-focused, friend-centered/restricted, and fully restricted. The most common network types among LGBT older adults were the friend-centered/restricted type (33%) and the diverse/no children network type (31%). Distributions of demographic characteristics, limitations in ADL, and total social network size differed by the social network types. The findings suggest that these social network types, independent of the effect of total social network size, have significant implications for mental health among LGBT older adults.

Of the five social network types identified in this study, the diverse, immediate family-focused, and fully restricted network types have been similarly observed in older adult populations in general. The diverse type is characterized as having better access to social resources in terms of relatively higher numbers of and more frequent contact with both family and friend and other non-family network ties when compared with the other types; on the other hand, those with the fully restricted type show very limited connections to any type of social ties. LGBT older adults with the immediate family-focused network type showed relatively higher proportion of being married or partnered and having close relationship with their children when compared with the other types. Although ex-partner ties did not substantially differentiate between the social network types we identified, the consistent presence of ex-partners within LGBT older adults' social networks may be a difference from heterosexuals' social networks; lesbian, gay, and bisexual adults may have greater motivation than heterosexual adults to maintain relationships with ex-partners because not doing so might damage their ties more widely within their social networks (Eeden-Moorefield, Martell, Williams, & Preston, 2011). Furthermore, because some ex-partners' identification may change to "friend" over time, our observation of ex-partner ties may be an underestimate because some have been incorporated into friend ties.

Unlike most studies of older adults in general (Fiori et al., 2006; Litwin & Shiovitz-Ezra, 2011), we did not find a single friend network type. Instead, two unique network types emerged among LGBT older adults: friend-centered/restricted and diverse/no children. In fact, these two unique types were dominant among LGBT older adults with each type representing about 30% of this population. Both types were characterized by close relationships with friends and the absence of children. LGBT older adults came of age in a context where discrimination, prejudice, and stigma toward same-sex parenting were more pervasive. Population-based studies have documented that LGBT older adults are less likely to have children than their heterosexual counterparts (Fredriksen-Goldsen, Kim, et al., 2013), relying instead on friend networks to provide or receive help and caregiving support as they age (Grossman et al., 2000).

Still, there were noteworthy differences between the friend-centered/restricted and diverse/no children types. For individuals with the friend-centered/restricted type, degrees of connectedness with family and non-family ties were weaker than for the diverse and immediate family-focused types. LGBT older adults with friend-centered/restricted social networks had relatively lower likelihood of having a partner or spouse than those with more diverse types and very limited interactions with neighbors. These findings are similar with other social network typology research (e.g., Fiori, Antonucci, & Akiyama, 2008) that has identified multiple types of friend-focused networks, distinguished by the amount of social support they receive. Social ties in friend-centered/restricted networks were mainly with close friends, with limited diversity of other types of social ties. On the other hand, many LGBT older adults adapt

well to living without children, building diversified social convoys over their life span ranging from partners/spouses, close friends, and neighbors, representing multiple social roles across their diverse networks in later life.

Differences in social networks are also related to personal factors, such as age and gender, according to the convoy model (Antonucci et al., 2014). It has been documented that among LGBT older adults, social network size decreases as age increases whereas the degree of social support does not vary by age group (Fredriksen-Goldsen et al., 2015). Interestingly, however, we found that LGBT older adults with the diverse/no children network type were older and had larger network sizes than those with the friend-centered/restricted type. Although unexpected, this finding may reflect increased frequency and diversity of social activities in older age (Cornwell, Laumann, & Schumm, 2008); for example, after retirement, individuals may have time to pursue a wider range of leisure activities and as a result diversify their social relations. In addition, the findings in this study show that those with the diverse, diverse/no children, and immediate family-focused types are more likely to be women than those with the friend-centered/restricted type. This finding is consistent with previous studies documenting that among older adults, women have larger and more diverse networks than men (Cornwell et al., 2008; McLaughlin, Vagenas, Pachana, Begum, & Dobson, 2010). Further research is needed to examine the interplay of such multiple personal factors on the formation of social network types.

Sexual and gender identity are also important personal factors that may be associated with the formation of social networks among LGBT older adults. In this study, those with the immediate family-focused type were more likely to self-identify their sexual identity as something other than lesbian or gay and their gender identity as transgender than those with the friend-centered/restricted type. Past experiences of opposite-sex marriage and having children may influence the formation of social networks in later life in this population. According to the Pew Research Center (2013), bisexual Americans are more likely to be married to an opposite-sex partner than are their lesbian or gay counterparts. Although it was beyond the scope of this study to examine the gender composition of current or former partnerships, this would be a rich topic for future studies to gain a deeper understanding of LGBT older adults' social networks over time. Transgender older adults have been found to be more likely to have children compared with non-transgender lesbian, gay, and bisexual older adults (Fredriksen-Goldsen et al., 2014). In addition, we found that transgender older adults were more likely to have the fully restricted type of social network, suggesting they may be at increased risk of social isolation. This finding is consistent with empirical studies showing that transgender adults perceive limited support from the lesbian, gay, and bisexual community (Weiss, 2004). According to our results, there is substantial diversity among LGBT older adults in terms of past and current experiences of family relationships. This range of experiences needs to be further examined to fully understand potential social resources in this population.

This study examined the association between social network type and mental health among LGBT older adults; the HEPM suggests that social resources positively influence health and well-being (Fredriksen-Goldsen, Simoni, et al., 2014). As hypothesized, the network types with more diversified social ties were associated with better mental health, even after controlling for total social network size and difficulties in ADLs as well as background characteristics. Empirical studies have found that a larger social network size is significantly associated with better mental health among lesbian, gay, and bisexual older adults (Fredriksen-Goldsen, Emlet, et al., 2013), yet our findings suggest that the composition of a social network is also important. LGBT older adults who have less diverse social ties, particularly those with the fully restricted type of social network, are of major concern: They report poorer mental health as well as a lower level of educational achievement and more difficulties in ADLs. Overall, the average network size of individuals with the fully restricted network type was less than one. Previous research has indicated that low levels of social support may partially explain the link between social network type and mental health symptoms (Fiori et al., 2006). Increased attention needs to be paid to this socially isolated group who may experience elevated risks of mental and physical problems but not be able to find necessary support within their social networks.

Limitations and Implications

Although this study provides a foundation for understanding social network types among LGBT older adults utilizing demographically and geographically diverse data, methodological limitations need to be considered in the interpretation of the findings. Due to the nature of the cross-sectional analysis, we cannot demonstrate causal associations between social network type and mental health. For example, having a diverse social network may lead to better mental health; alternately, those who have better mental health may also have better capacity to socialize with other people and diversify their networks. Longitudinal research is needed to examine how changes in social network size and composition influence health and how health influences social networks over time in this population. The limitations of self-report measurement also apply; for example, individuals may overestimate their number of close ties when asked for a count (Feld & Carter, 2002). In addition, although we attempted to attenuate sampling bias by applying survey weights, some hard-to-reach segments of the LGBT older adult population may have been missed by our sampling strategy, limiting the generalizability of findings. Finally, this study utilized data collected prior to the 2015 U.S. Supreme Court decision legalizing same-sex marriage. Future research is needed to investigate whether

this policy change will influence the distribution of social network types among LGBT older adults.

In addition to methodological limitations, it was outside the scope of this study to examine other important correlates of social network type that could provide a more comprehensive view of the processes underlying social network development. For instance, according to the convoy model, social convoys are constructed over the life course and the formation of social relations is influenced by earlier life experiences. Among LGBT older adults, life experiences such as discrimination and victimization, identity disclosure and concealment, and family relations and socioeconomic status during childhood or early adulthood may be related to social network type in later life. Further research is needed to understand what previous life experiences help LGBT adults to be resilient in building and maintaining robust social networks despite societal marginalization.

It will also be important in future research to investigate explanatory mechanisms accounting for the relationship between network types and mental health. The HEPM suggests several socially related pathways to mental health. For example, other social resources we did not examine, such as social support and relationship quality, may explain the association between network type and mental health. Another possible mechanism is behavioral: Network types may be associated with health behaviors such as health care utilization and substance use, which in turn contribute to health outcomes. Shiovitz-Ezra and Litwin (2012) found that older adults with limited social ties are at elevated risk for excessive alcohol consumption and lack of physical activity; this issue should also be explored for LGBT older adults, especially given the degree of social isolation experienced by those with fully restricted network ties.

Despite its limitations, this network typology study points to practical implications for improving services to LGBT older adults. The people most in need of help and resources are also likely the hardest to reach because of their disconnectedness, which suggests the need for targeted efforts to identify those at highest risk. Furthermore, by identifying the social network profiles of subgroups who are at risk of poorer mental health, we may gain a greater understanding of associated risk factors and develop interventions to improve social connectedness. For example, for LGBT older adults whose social isolation limits both access to resources and potential for psychological well-being, programs aimed at providing access to resources (e.g., transportation) may also provide valuable opportunities for social interaction and engagement. Future waves of longitudinal data will allow us to examine how social networks change over time and what factors are associated with maintaining positive social relationships in older age, strengths that may be harnessed to assist individuals who are less socially connected to attain good health and well-being.

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